

## OBSERVATIONS ON THE MATING BEHAVIOR OF HARVESTER ANTS

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A variety of observations have been published on the nuptial flights of harvester ants of the genus *Pogonomyrmex*. Winged males and females have been observed leaving the nests, and the establishment of new nests by the deilated and mated females has been recorded. However, observations on the mating behavior, which intervenes between leaving of the parental nests and establishment of new ones, have not been published to my knowledge. Some individuals mate at the parental nest entrance, for Wheeler (1910, "Ants," p. 288) in describing the flight from the nest of *Pogonomyrmex barbatus molefaciens* Buckley, says, "The amorous males seized many of the females before they could leave the ground." The great majority flew before mating, however, and the observations recorded below concerning *Pogonomyrmex barbatus* (Smith) (determined by M. R. Smith) indicate that after the winged individuals fly from their parental nests many of them assemble at the summit of some distant high object (a hill or a tree) and mate there. After mating the females fly again, presumably dispersing and, with good fortune, establishing new nests.

The first and most complete observations were made on a hot sunny afternoon (beginning at 3:00 p.m.) June 23, 1947, near El Paso, Texas. Winged individuals of both sexes were found congregating in an area about fifteen feet square on the top of a high and very steep hill.<sup>2</sup> Although this area was on the summit

<sup>1</sup> The observations here recorded were made on the David Rockefeller Expedition to northern Mexico in 1947 from the American Museum of Natural History.

<sup>2</sup> On this hill the mating flights of another ant, *Solenopsis (Diplorhoptrum)* sp?, a small dark colored species, were observed.

The males swarm in small, rather compact masses, 6-18 inches above the ground, flying about very actively and looking exactly like a swarm of small chironomids. Like chironomid swarms, those of this ant are dispersed some-

of the hill, it included by no means the entire summit. It is evident, therefore, that some factor other than mere altitude must delimit the congregating area. There were thousands of winged ants in this area, buzzing sufficiently to be distinctly noticeable from the sound. Additional individuals approached constantly, flying upwind toward the congregating area as though they were attracted by odor. They flew up the hillside from two to twenty feet above the ground. It was not discovered from what nests these individuals came, but it was evidently from some distance as no nests were found on the hill or in the immediate vicinity. The great number of individuals suggested that they may have come from many nests.

Within the congregating area, individuals tended to alight on the highest points. Almost the only vegetation in the area was a few small *Agave* plants, and their leaves were nearly covered. Many also were in areas shaded by the *Agave* leaves. Great numbers alighted on a person standing in the congregating area.

On alighting the ants, more especially the males, moved about actively as though excited. Individuals were so numerous that within a few seconds after alighting a female was usually found by a male. Recognition seemed to be dependent on contact. Males passing very close to females did not show indications of recognition, but if they touched, recognition was immediate and the male climbed onto the back of the female. When two males met only rarely did one try to climb onto the other, and after a moment they would separate and run about again. The finding of a female by a male seemed dependent on the extremely active running about of the latter.

The mating behavior is very stereotyped. When a male finds a female he quickly mounts her, grasping her body with his legs, his forelegs usually being around her thorax, his mid and hind legs around her abdomen. Her wings are flat over her back, under his body. He also grasps the anterior end of her thorax

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what by a breeze but reform in about the original position when the breeze fails.

The females fly less rapidly than the males and are seen in very much smaller numbers. They fly more or less erratically, not in swarms. Presumably, as with chironomids, the females are pounced upon when they pass through swarms of males. Mating was not observed, however.

with his mandibles. At the same time, he curls the apex of his abdomen downward and the genitalia meet and quickly unite. At this time the bodies of both are approximately straight. Her mandibles are held wide open. This position is maintained for from 10 to 60 seconds (average of 25 matings about 28 seconds).

After this the male, retaining the genitalie union, slides backward, curling his body, often nipping at the female's thorax, petiole, and gaster on the way, but quickly taking up a curled position so that his mandibles can reach the joined genitalia, which he seems to chew. At about the same time the female also turns or curls so that she can reach his body with her mandibles. She may bite his petiole momentarily, but quickly finds his gaster, which she pinches so strongly that it is much compressed. This is done repeatedly, and continues, with the biting of the genitalie region by the male, for as long as this position is maintained, *i.e.*, one to ten minutes (average of 25, 3.1 minutes).

Then the pair separates, the male scurrying about as before and the female walking more slowly, also as before. Often she will work her sting in and out a few times. She may fly away after a short time, flying more or less directly upward. More often, however, she is quickly found by another male. Sometimes a second or even third mating occurs in quick succession without her repulsing the males. More often she will resist for a few seconds by projecting her sting directly upward from the apex of the abdomen each time the male attempts to copulate. This may happen half a dozen times, the male riding on her back, but in every case observed second copulation was finally permitted by the female. It differed in no detail from first copulations. Double or possibly even multiple copulation seemed to be frequent.

Often one or more males will find and cling to copulating pairs, and such individuals often are the ones to mate with the female as soon as the first copulation is completed.

As would be expected from the constant departure of mated females, a very great excess of males develops in the congregating area, all of them, apparently, actively searching for females, even though many of them have already mated one or more times.

Individuals of both sexes were found which were wholly red

and which had the head and thorax black. Mating occurred indiscriminately between these two color forms.

Another series of observations by Dr. Herman T. Spieth was made in an area containing numerous nests of the same species at Carta Blanca, sixteen miles west of Matachic, Chihuahua, Mexico, on July 8, 1947.

Winged forms were emerging from the nests.

In the two tallest trees in the area winged forms were assembling, approaching the trees from various directions. Among the upper branches of the trees they were buzzing about in immense numbers. Details of their activity there could not be observed because of the height. Each gust of breeze, however, dislodged a number of small balls of ants, each consisting of a pair in copulation and several males. No doubt the females most overburdened by males were the ones to fall. These females, so far as observed refused to copulate with other males and flew away after a time. As on the hilltop a great preponderance of males was left, partly as a result of the departure of females.

On July 26, 1947, at Catarinas, Chihuahua, Mexico, Dr. Spieth found great numbers of dead males of *Pogonomyrmex barbatus* on a hill top which had evidently been used as a congregating area, and some dead males were found by the author in a similar situation near Encino, Durango, Mexico, on July 27, 1947.

It has been suggested by some workers that the frequency of brother-sister matings resulting from colonial life might be one of the reasons for the great number of closely related but recognizably distinct populations among ants. The observations here recorded suggest, however, that in *Pogonomyrmex barbatus* individuals from numerous colonies assemble and mate in certain areas. This, together with multiple mating of both sexes, insures considerable panmixia. Multiple mating is of regular occurrence in some other ants as well, for example *Prenolepis imparis* Say (see Talbot, 1945, Amer. Midland Nat., 34: 506).